

2—PECTENS OF THE GINGIN CHALK.

BY

F. R. FELDTMANN.

Read 14th June, 1949.

INTRODUCTION.

Although it is nearly 90 years since fossils were first found in the Gingin Chalk, the only comprehensive paper on the larger forms that has appeared so far is that by Etheridge (6)* published in 1913. Of subsequent papers, those by Withers on the stalkless crinoids *Uintacrinus* (17) and *Marsupites* (18) were of particular importance as the discovery of these forms definitely established the age of the Gingin Chalk as Santonian (Middle Senonian).

A detailed survey, by the writer, of McIntyre Gully, two miles north of Gingin railway station, during 1939, followed by systematic collecting by student parties from the University of Western Australia under Professor E. de C. Clarke in 1940 and 1941, showed that of a total thickness of 67 feet of chalk at that locality, the lower 20 feet 3 inches corresponds to the European zone of *Marsupites testudinarius* and like it is separable into a lower *Uintacrinus* subzone and an upper *Marsupites* subzone; the *Uintacrinus* subzone extends from the base of the Chalk to 13 feet 3 inches above and the *Marsupites* subzone from 13 feet 3 inches to 20 feet 3 inches.

Since Withers' papers were published much material has been collected and many new forms await description. Of these, only one small group, the pectens, is dealt with in the present paper.

Only one pecten, *Camptonectes ellipticus*, was described in Etheridge's paper (6, pp. 19, 20, Pl. 1, figs. 16, 16a). Glauert's list of Upper Cretaceous fossils included, in addition to this species, species of *Pecten*, *Chlamys*, and *Amussium* (9, p. 58), but no descriptions of these have been published.

Most of the pectens described in the present paper are from the *Marsupites* subzone at McIntyre Gully and at Molecap Hill, half a mile south-east of the railway station. At the last-named locality the evidence supplied by the occurrence of the more restricted forms indicates that the lower 11 feet of the *Uintacrinus* subzone is missing from the Chalk, and there is an overlap of the two crinoids between 2 feet 6 inches and 3 feet 2 inches above the base of the Chalk. A very few specimens of pectens have been found in the *Uintacrinus* subzone, but, with the exception of one species, *Chlamys subtilis*, insufficient material has been collected for accurate description. Two specimens representing species different from those of the Chalk have been found in the underlying Lower Greensand and are described at the end of this paper.

The *Syncyclonemas* represent an interesting development of a new group in Western Australian waters.

The Gingin pectens are all more or less fragile and most of the material available for examination was in a poor state of preservation, much being very fragmentary. Several of the better preserved specimens still retain

* The numbers in heavy type shown in parenthesis correspond to those of the papers mentioned in the Bibliography.

some colour, this being noticeable in the three species of *Syncyclonema*, particularly in *S. subserratus* and *S. subreticulatus*. Descriptions are from specimens in the collection of the Geology Department of the University of Western Australia and from those in my own collection. Type specimens are in the possession of the Geology Department.

I wish particularly to express my gratitude to Professor E. de C. Clarke for his encouragement and for permitting me to make full use of the Geology Department's collection and library; to Dr. Curt Teichart and Dr. R. W. Fairbridge for their generous assistance in many ways; and to Mr. H. W. Smith for the excellent photographs which accompany this paper.

DESCRIPTION OF SPECIES.

Superfamily **PECTINACEA**.

Family **PECTINIDAE** Lamareck.

Genus **PECTEN** Müller.

Subgenus **SYNCYCLONEMA** Meek, 1864.

Section **CTENIOPLEURIUM** nov.

Distinguished from *Syncyclonema* s.s. by the presence of fine, usually spinous, radial threads or riblets. Type: *Syncyclonema subreticulatus*. Shell nearly equilateral, inequivalve, the right valve slightly convex, the left valve moderately so, suborbicular to ovate, apical angle wide; ears usually ascending slightly above the umbo, subequal, anterior ear of right valve slightly the larger, byssal sinus absent or very shallow; ctenolium absent; hinge with two pairs of well-developed crura; margin entire. Radial ornament of low narrow threads or riblets which may be spread over the surface of the valve or confined to the submargins; closely set spines may be present on all the riblets or confined to those of the submargins. Concentric laminae and fine concentric striae as in *Syncyclonema* s.s., but fine concentric threading may also be present. Surface of shell glossy or waxy. Interior smooth.

Syncyclonema (Cteniopleurium) subserratus sp. nov.

Pl. I., Figs. 1-3.

The material available for examination consisted of three nearly perfect specimens, including a fairly large right valve and two rather smaller left valves, and the ventral half of a still larger right valve, all from Molecap.

Dimensions :—

			Syntype. Right valve.	Paratype. Left valve.	Syntype. Left valve.
			mm.	mm.	mm.
Height	....	....	26.8	23.7	22.6
Length	....	....	26.6	23.2	21.0

The valve represented by the ventral fragment was probably fully 30 mm. in length.

Diagnosis.—Shell fairly thin, suborbicular to subovate, height equal to or slightly greater than length, nearly equilateral, inequivalve. Dorsal margins straight, the anterior usually slightly longer than the posterior, both being rather longer than half the height of the shell. Umbones fairly sharp, apical angle about 107°. Hinge line straight, about equal in length to one-third the length of the shell. Ears rather small, nearly equal, the anterior slightly the

larger, both ascending slightly above the umbo and bent very slightly backwards from their junctions with the disk; byssal sinus absent. Surface of shell smooth and glossy when well-preserved. Interior of shell smooth. Margin entire. Ventral arc includes an angle of nearly 240° .

Right valve nearly flat. Concentric ornament consists of about five well-marked and fairly evenly spaced growth rings, averaging about 3 mm. apart on the syntype; a few less prominent rings are also present; the growth laminae are ornamented with very numerous fine concentric striae, hardly visible to the naked eye. Submargins decorated with, usually, five or six radial riblets, the two, sometimes three, nearest the dorsal margins being the longer and better defined; each riblet furnished with a row of short thin tooth-like spines, sharply inclined towards the dorsal margins and up to ten in number on the longer riblets. Incipient radial ribbing of the median portion of the disk is suggested by barely discernible low narrow undulations on the ventral portion of the valve. Distal margin of anterior ear convexly curved; surface of ear shows fairly well defined growth lamellae from which a row of small, low, tooth-like spines, directed dorsally, serrate the dorsal margin of the ear; finer concentric striae are also present. Posterior ear slightly oblique, distal margin straighter than that of anterior ear; ornament similar to that of anterior ear.

Left valve moderately convex, slightly compressed near the dorsal margins. Concentric ornament of very numerous fine striae, visible under a lens, and more prominent growth rings fewer, less evenly spaced, and less marked than those of the right valve, the left syntype showing three fairly distinct, irregularly spaced rings. Radial ornament of the disk similar to that of right valve. Distal margin of anterior ear less curved than that of right valve. Posterior ear slightly more oblique than the anterior. Ornament of ears similar to that of right valve, but the more prominent concentric lamellae of the anterior ear are less evenly spaced. The hinge, exposed on the paratype, consists of two pairs of strongly supported narrow crura, the lower pair, which are less clearly defined, diverging at very acute angles from the upper and separated from them by narrow rounded furrows. The dorsal surface of the hinge is formed by the dorsal margins of the ears being bent inwards at an acute angle to form very narrow triangular shelves approximately normal to the commissure and widest distally, the straight inner edges of the shelves forming the upper crura; on the shelves, the growth lamellae, particularly the outer two, rise as strong curved ridges slightly inclined towards the umbo, their inner ends crenulating the upper crura. The distal ends of the hinge are clearly defined, projecting inwards well beyond the interior surface of the ears.

Remarks.—Except for the radial riblets on the submargins, this species shows a fairly close resemblance to *Syncyclonema orbicularis* Sowerby and *S. membranaceus* Nilsson. Prominent concentric laminae are apparently fewer on right valves of the Gingin species than on those of *S. orbicularis* as figured by Woods (20, Pl. XXVII.), the dorsal margins are slightly longer in proportion to the height of the valves, and the angle between them and the ventral margin is more marked.

This species is the most strongly coloured of the Gingin pectens, the two left valves being of a noticeable creamy yellowish brown colour. The more weathered right valves are of a rather patchily distributed pale reddish colour.

The species, so far as I know, has been found only at Molecap, where it occurs near the junction of the *Uintacrinus* and *Marsupites* subzones.

Syncyclonema (Cteniopleurium) subreticulatus sp. nov.

Pl. I., figs. 4, 5.

The material examined consisted of a nearly complete but partly decorticated valve (the holotype) and another nearly complete valve, recovered in a fragmentary condition, from McIntyre Gully, two, in a similar condition, from Molecap, a few other fragments from both localities, and a fragment from Hosking's Chalk, a mile north-west of McIntyre Gully. All are right valves.

Dimensions :—

		Holotype. McIntyre Gully.	Paratype. McIntyre Gully.	Paratype. Molecap.	Paratype. Molecap.
		mm.	mm.	mm.	mm.
Height	....	29.5	32.0	27.6	24.8
Length	....	26.5	30.0?	26.2	23.3

Diagnosis :—Shell thin in the middle and umbonal portions but thickening near the margins, suborbicular to ovate, height greater than length, nearly equilateral. Dorsal margins straight, but merging almost imperceptibly into the ventral margin; postero-dorsal margin slightly longer than the antero-dorsal and about equal to half the height of the shell. Umbo fairly sharp, apical angle 105° or 106° . Hinge-line straight, length of hinge rather more than one-third the length of the shell. Ears of moderate size, the anterior slightly larger than the posterior, both ascending slightly; byssal sinus very small. Interior of shell smooth; pallial line obscure, remote. Ventral margin entire; ventral arc includes an angle averaging about 230° .

Right valve slightly convex; surface of disk nearly smooth except at and immediately below the submargins. Concentric ornament of, usually, five or six fairly evenly spaced more prominent growth lines and innumerable fine incremental striae; in addition, an exceedingly fine and barely discernible concentric threading, fairly regularly and closely spaced, is present. The radial ornament consists of exceedingly numerous, closely spaced low threads, which start at a distance from the umbo about equal to a quarter of the height of the valve; on the median three-fifths of the disk, the radial threads are barely visible to the naked eye, except close to the ventral margin where they form a minute network with the concentric threads which are widened and thickened where they pass over the radials. At a distance from the lateral margins approximately equal to a fifth of the length of the valve, the radial threads become more prominent and clearly defined and their junctions with the concentric threads are marked by closely spaced nodes, which become larger and farther apart near the dorsal margins, developing into short tooth-like spines on the three or four threads nearest the margins. Where the outer layer of shell is missing from the middle portion of the holotype only the concentric ornament is present.

Outer margins of anterior ear rounded, the distal margin descending in a slightly sinuous curve to a very shallow byssal sinus. Concentric ornament of fine striae and a few stronger ridges, some bearing a short tooth-like spine at the dorsal end. Radial ornament of four or five, usually faint, threads with low nodes at their junctions with the more prominent concentric ridges. Posterior ear smaller and more oblique than the anterior, outer margins rounded on the holotype, but on the paratypes the posterior ears are more nearly triangular in shape; concentric ornament similar to that of anterior ear; radial ornament of posterior ear obscure on the holotype, but on the smallest valve it consists of three rather indistinct threads with fairly closely

spaced, short imbricating spines ; three stronger spines also rise above the dorsal margins. The junction of the anterior ear with the disk is marked by a very narrow beading of cross ridges, which starts about half-way down the junction, divaricating below the ear to follow the major growth lines for a short distance.

Hinge generally similar to that of *S. subserratus*, but the lower crura are much wider than the upper and are stronger and wider and their ventral margins are more clearly defined than on the paratype of *S. subserratus* ; this, however, may merely represent the difference between the hinges of right and left valves ; the lower limb on the posterior ear is rather wider than that on the anterior ear and its ventral margin is more convexly curved. Very fine closely spaced cross ridges are visible on the crura of the better preserved valves. The upper crura are crenulated by the ends of the curved ridges which represent the growth lamellae on the dorsal surface of the hinge ; as in *S. subserratus* the two outer ridges are more prominent than the rest, and end as short tooth-like spines.

Left valve not seen.

Remarks :—Individuals of this species vary in degree of convexity and in the strength of their radial ornament, which is more marked on the holotype than on the other specimens. The largest specimen is nearly flat and its surface, which, like that of the other paratypes, is better preserved than that of the holotype, is nearly smooth, except for the growth ridges and the radial threads near the lateral margins, the radial ornament of the median portion appearing to the naked eye as fine striae, even near the ventral margin. The two Molecap specimens are rather more convex ; on the larger of these only the lateral radial ornament is visible, the remainder of the disk appearing smooth except for two growth rings near the ventral margin. On the smallest valve the radial threads are rather more prominent. The radial threads of this species are more closely spaced than those of *S. Subserratus*. The surface of the better preserved valves is pale buff in colour and has a waxy lustre.

In its shallow byssal sinus *Syncyclonema subreticulatus* resembles the Southern Indian species *S. sivaicus* Stoliczka (14, p. 435, Pl. XLII, fig. 5), but the ears of the Gingin species are more rounded than those of *S. sivaicus*. The reticulated appearance of the median portion of the disk recalls to some extent that of *Chlamys intertextus* Roemer, which Arkell (2, pp. 102, 103, Pl. VIII, figs. 1, 2) has taken as the type of his subgenus *Camptochlamys*, but the concentric ornament of the Gingin shell is fine, instead of coarse as in *Camptochlamys*, and in other respects there is no resemblance.

The species is one of the least scarce of the Gingin pectens. The McIntyre Gully specimens were found at about two feet or less below the top of the *Marsupites* subzone, whereas the Molecap specimens were found nearer the middle of that subzone. The shells are very brittle and almost impossible to recover intact.

***Syncyclonema* (*Cteniopleurium*) *perspinosus* sp. nov.**

Pl. I, figs. 6–8.

The available material consisted of four fairly well preserved specimens, all apparently left valves, and portions of six other valves. All except one are from the lower half of the *Marsupites* subzone at Molecap, the remaining

specimen, a ventral fragment, being from the middle of the same subzone at McIntyre Gully. The McIntyre Gully specimen is flatter than the others and its growth rings are more regularly spaced; it may represent a right valve.

Dimensions :—

	Holotype.	Paratype.	Paratype.	
	mm.	mm.	mm.	mm.
Height	25.9	26.8	22.3	19.8
Length	25.0	25.4	20.4	18.3

An incomplete valve (U.W.A. 17198a) from which most of the anterior half is missing has a height of 31 mm.

Diagnosis :—Shell thin and translucent in the middle and umbonal portions, thicker and opaque near the lateral and ventral margins, suborbicular to ovate, height rather greater than length, almost equilateral; dorsal margins straight, approximately equal in length and usually a trifle longer than half the length of the shell. Ears rather small, subequal; hinge fairly strong, hinge-line straight or descending very slightly from the umbo, length equal to about two-fifths the length of the shell. Umbones sharp, apical angle ranging from about 103° to 108° , usually about 107° . Surface of shell waxy or glossy when well-preserved. Ventral margin entire; ventral arc includes an angle of about 230° . Interior of shell smooth; pallial line remote.

Right valve not seen.

Left valve moderately convex. Concentric ornament of disk consists usually of four or five more prominent growth-rings, irregularly spaced, and innumerable fine striae discernible only under a lens. Radial ornament of, usually, 25 low narrow main ribs starting near the umbo, as well as eight others interpolated on the ventral half of the valve; of these last, usually five start about half-way down the valve, the remaining three near the ventral margin. The interspaces between the main ribs are fully twice as wide as the ribs. The smallest nearly complete valve has only 21 main ribs, and eight others interpolated near the ventral margin, the interspaces being wider than usual. The ribs are decorated with closely set high spines, normal to the surface of the shell; near the umbo, the spines start as a faint beading of low nodes. The number of spines on each rib usually ranges from 15 on the ribs nearest the dorsal margins to 30 on the median ribs, but on the second smallest specimen the range is from 9 to 20. In cross section the thickness of the spines is greatest parallel to the concentric striae; the dorsal sides are convex and the ventral straight or slightly concave; distally the spines end in a convexly curved edge extended in a direction parallel to the concentric striae. Both ears obliquely triangular in shape, with the outer angles slightly rounded; the dorsal and distal margins usually straight, but the distal margin of the anterior ear may be slightly curved convexly. Ears separated from the disk by a very narrow beading of fine ridges normal to the line of junction. Anterior ear ornamented with concentric lamellae and two radial rows of small spines with a third row along the dorsal margin; posterior ear with similar concentric lamellae and three rows of still smaller spines with a fourth row along the dorsal margin. Hinge similar in type to those of *S. subserratus* and *S. subreticulatus*; as in the paratype of *S. subserratus*, the upper crura are the stronger and more sharply defined; they, and particularly the posterior limb, appear to be wider distally than the upper crura of the other two species; the intercrural groove is usually deeper and wider on the posterior half of the hinge, and the lower limb descends at a slightly

greater angle ; thin curved ridges terminating the grooves distally and linking the lower and upper crura are more distinct than in the other species ; fine cross ridging of the grooves and lower crura is visible on the better preserved specimens.

The difference between the thickness of the umbonal and middle portions of the disk and that of the marginal portions is very marked in the larger valves ; the thicker portion forms a concentric band about equal in width to a quarter the height of the valve ; the thickening starts just within the ventral margin, the margin itself being thin.

The exterior surface of the valves is pale creamy or yellowish brown in colour, paler and, in some specimens, yellower than that of *S. subserratus*.

Remarks :—In its radial ornament this species shows a certain resemblance to the North American Miocene species *Chlamys coccymelus* Dall (3, p. 741, Pl. XXXIV, fig. 1), but in the Gingin species the ribs and the spines are more numerous, and the spines are apparently more erect, and irregularly distributed secondary ribs with spines similar to those of the main ribs are present in the interspaces instead of the beaded radial threads of the American species. In other respects the shells are markedly different.

The three species described above form an interesting group, the members of which differ from the more typical *Syncyclonemas* in the presence of radial ornament, but resemble them in the principal characters of the shell. *S. subserratus* forms a link between the more strongly ornamented members of the group and the normal *Syncyclonemas*. The difference in thickness between the umbonal and middle portions of the disk and the lateral and ventral portions so marked in *S. perspinosus* is less noticeable in *S. subreticulatus* and very slight in *S. subserratus*.

Subgenus **CHLAMYS** Bolton, 1798.

Chlamys subtilis sp. nov.

Pl. II., figs. 1–3.

The material examined consisted of seven specimens from Molecap, all more or less imperfect and including three left valves, two right valves and two indeterminable. The horizon of six of these is uncertain, but is probably the upper portion of the *Uintacrinus* subzone, from the appearance of the enclosing chalk ; the seventh, a small right valve, is from about 2 ft. 6 in. above the base of the Chalk.

Dimensions :—

	Right Valve.	Right Valve.	Left Valve.	Left Valve.	Probable left valve with ears missing.
	Holotype.		Anterior half.		
	mm.	mm.	mm.	mm.	mm.
Height	17.5	14.7	19.2	17.5	16.3
Length	15.3	12.8	?	15.5 ?	13.8

Diagnosis.—Shell small, thin, ovate, higher than long, nearly equilateral ; dorsal margins nearly straight and equal in length, antero-dorsal very slightly the longer and usually slightly concave, postero-dorsal slightly convex. Ears of moderate size, unequal, byssal sinus well-defined, hinge-line straight or descending slightly from the umbo and slightly longer than half the length of the disk. Umbones sharp, apical angle 86° or 87° . Margin entire. Interior of shell smooth, pallial line obscure.

Right valve very slightly convex, ornamented with between 60 and 70 low narrow radial threads or riblets, mostly arranged in pairs, a few single threads being interpolated in the ventral portion of the valve; the riblets on the posterior submargin are rather stronger than those elsewhere. Apart from two clearly defined growth laminae, the concentric ornament of the holotype is obscure, being represented only by faint minute raised threads on the radial riblets, but closely spaced fine concentric threading is visible over the greater part of the disk of the smaller right valve. The radial and concentric threading gives a lattice-like appearance under a lens, but to the naked eye only the radial ornament is visible. On the ventral, particularly the postero-ventral, portion of the disk the shape of the radial and concentric threads is modified by a fine, closely spaced diagonal striation, discernible both on the radial threads and in the interspaces. Anterior ear rather small, produced, alar in shape, distal margin rounded, lower margin descending slightly in a sinuous curve towards the disk; radial ornament consisting of 7 (?) low threads modified by faint concentric threading near the dorsal margin, which is serrated slightly, both by the concentric threading and by the raised margins of the growth lamellae; fasciole shallow, with concentric ridges not very strongly marked; the ctenolium appears to consist of four minute denticles. Posterior ear small, triangular, oblique, the distal margin slightly concave dorsally; radial ornament of three narrow threads on the lower half of the ear, diagonal striae being visible in the interspaces; concentric ornament of fairly closely spaced faint lamellae, which inbricate slightly at the dorsal margin.

Left valve rather more convex than right valve. Radial ornament of low threads similar to those of right valve. The threads appear to range from about 40 to 80 in number, the total number probably depending largely on the number of interpolated threads. Concentric ornament of very fine threads, more prominent where they pass over the radial threads. Diagonal striation, modifying the shape of the radial and concentric threads, was noticeable only on the better preserved antero-ventral portions of two of the left valves examined. Anterior ear moderately large with convex distal margin; radial ornament of closely set threads with, on one specimen, a trace of diagonal striation in the interspaces; visible concentric ornament consists of a few growth laminae. Posterior ear not seen.

Remarks.—*Chlamys subtilis* appears to be confined to the upper portion of the *Uintacrinus* subzone. The rock enclosing six of the specimens examined has the characteristic appearance of the lowest foot of the Molecap Chalk, which contains noticeably more and coarser glauconite than the rest of the exposure, and I have found fragments belonging to this species at about six inches above the base of the Chalk. The small right valve is from the approximate top of the subzone.

In its ornament and proportion of length to height, this species would appear to resemble *Camptonectes ellipticus* Eth. fil. (6, pp. 19, 20, Pl. I., fig. 16), although the difference in the shape of the anterior ears of the right valves, the greater size of *C. ellipticus*, in which, also, the junctions of the dorsal and ventral portions of the disks are less marked, show them to be separate species. I have not been able to trace the type of Etheridge's species, nor have I come across any other specimens, although, according to Glauert's list (8, p. 11), it is moderately common at One Tree Hill. The markedly ovate shape of Etheridge's species and the presence of radial riblets in addition to divaricating striae suggest that it should be assigned rather to *Chlamys* than to *Camptonectes*. As Dall (3, pp. 695, 696) and others have shown, the *Camp-*

tonectes striation is not confined to the shells of that subgenus but occurs also in *Chlamys* and *Aequipecten*. There also appears to be a close resemblance in ornament and proportion between *Chlamys subtilis* and *Pecten greenoughiensis* Moore (13, p. 248, Pl. XI., fig. 10), and it is possible that the species are identical, although Moore's figure shows the ears of his species to be set much lower than those of *C. subtilis*, the antero-dorsal margin as convex instead of straight or slightly concave, and he does not mention the presence of diagonal striae. Unfortunately nothing is known of the circumstances of occurrence of Moore's specimen or of the exact locality from which it was obtained.

***Chlamys ginginensis* sp. nov.**

Pl. II., figs, 4-6.

Although this is the commonest species of *Chlamys* in the Gingin area, so far as I know, no really well preserved specimen has been found. The material examined consisted of the remains of a dozen individual valves, most in a very fragmentary condition. The disks of only two right valves and one left valve were nearly complete, the anterior ears being missing, and the anterior ears were present only on two left valves and one right valve, all very imperfect. Details of the surface ornament were particularly well preserved on the ventral fragments of a right valve and a left valve, both larger than the specimens of which it was possible to obtain measurements.

Dimensions :—

	Cotype.	UWA17290a	UWA17290c	UWA12790b	Cotype.	
	Right Valve.	Right Valve.	Left Valve.	Left Valve.	Right Valve.	Left Valve.
	Molecap.	Molecap.	McIntyre	Molecap.	Molecap.	McIntyre
			Gully.			Gully.
	mm.	mm.	mm.	mm.	mm.	mm.
Height....	16.9	21.7	18.6	17.1	15.8	15.7
Length	15.2	18.4	17.5	15.1	14.1	13.7

Diagnosis.—Shell small, thin, subovate to ovate, higher than long, inequivalve, inequilateral, usually slightly oblique. Antero-dorsal margin straight or slightly concave and longer than postero-dorsal, which is short and slightly convex; submargins narrow but fairly well defined. Ears of moderate size, unequal; byssal sinus well-marked. Hinge-line not straight, descending slightly from the umbo; length of hinge about equal to half the height of the shell. Umbones sharp, rising slightly above the hinge-line, apical angle about 89°. Ventral margin entire. Pallial line obscure.

Right valve flat, the disk ornamented with fairly strong low rounded main radial ribs, ranging from 13 to 20, but usually 14 to 16 in number; on the submargins the ribs are obsolete. Near the umbo the ribs become less distinct and pass into groups of two or three threads, with additional threads in the interspaces. The interspaces are usually slightly narrower than the ribs. Occasionally the place of one of the main ribs is taken by a pair of narrower ribs. The number of ribs is increased by interpolation of secondary ribs or, more rarely, by bifurcation; both types of increase may occur on the one valve. The number of ribs interpolated ranges from 1 to 12, and on some valves interpolation takes place only below the first growth ring; the interpolated ribs are usually narrow but those interpolated below the first growth ring may be nearly equal in width to the main ribs. Concentric ornament consists of evenly spaced fine, low threading, more prominent where it crosses the ribs, but visible only on the better preserved specimens. The larger

valves show one or two prominent growth laminae, which thicken at their margins to rise abruptly above the next ventrally situated lamina; on the ventral fragment of a large right valve, the difference in elevation is one millimeter. Very numerous closely and evenly spaced fine diagonal striae, directed downwards in the median portion of the valve at an angle approaching 45° from a median line but nearly horizontal at the junction of the dorsal and ventral margins, are present in the interspaces of the better preserved valves. Anterior ear rather small, produced, distal margin rectangularly truncated or slightly rounded, distal portion of lower margin approximately parallel to dorsal margin; radial ornament of three fine slightly waved threads set closely together just above the middle of the ear; fasciole wide, with closely set strong curved, concentric ridges inclined towards the umbo and passing, on the ear, into finer, less distinct growth lamellae, which pass threadlike over the radial threads; at the dorsal margin of the ear, three evenly spaced growth lamellae imbricate as small tooth-like projections; ctenolium with three short, relatively stout spines; smaller spines of earlier stages of ctenolium, diminishing in size towards the umbo, are visible at the junction of the disk and the fasciole. Posterior ear small, triangular, oblique, distal margin convexly curved; ornamentation of three low radial riblets rather more prominent and more widely spaced than those of the anterior ear; the riblets crossed by growth lamellae decorated with small nodes, or tooth-like spines, at the junctions, the lamellae projecting as short teeth above the dorsal margin of the ear. Interior of valve smooth except a small area above the first growth ring where it is faintly fluted in harmony with the exterior ribbing. Two pairs of long cardinal crura start at a short distance from the resilial pit, the upper pair extending to the distal margins of the ears, the lower to within a short distance from the margins; the lower pair, which are slightly the thicker, diverge radially from the upper at an exceedingly acute angle, the intervening furrows starting at about one-third the distance from the resilial pit to the distal margins of the ears.

Left valve moderately convex; ornamentation of disk similar to that of right valve. Anterior ear relatively large, outer angle obtuse, distal margin convex, radial ornament of four well-marked rounded riblets as well as a pair of narrower riblets close to the junction with the disk; concentric ornament of three more prominent growth lamellae as well as barely perceptible, fine incremental lines. Posterior ear small, triangular, oblique, distal margin straight or slightly convex; radial ornament of two main riblets and a narrower pair close to the disk; concentric ornament of three or four growth lamellae with short thick spines at their junctions with the riblets. Interior of disk usually wholly shallowly fluted, but that of the large better-preserved ventral fragment is smooth near the ventral margin. Cardinal crura similar to those of right valve, except that the upper pair are slightly the thicker, especially at the distal ends.

Remarks.—The largest right valve measured (U.W.A.17290a), of which two anterior, three median, and one posterior ribs are bifurcated, is probably merely an unusual example of bifurcation within this variable species rather than a representative of a separate species, as bifurcation of single ribs occurs in other specimens and other features of the valve, including the number of spines in the ctenolium are similar.

This species closely resembles *Chlamys britannicus* Woods (20, p. 167, Pl. XXXI, figs. 1, 2) in shape, apical angle, and radial ornament. Woods states that the ribs of his species do not bifurcate and that only rarely is a new rib introduced between two others. On the other hand, the large number

of relatively narrow ribs present on the ventral fragment figured by him (fig. 1a) suggests bifurcation or interpolation as in the Gingin species. The anterior ear of the left valve is relatively larger in the Gingin species. The concentric ornament of *C. ginginensis* more nearly resembles that of *Aequipecten arlesiensis* Woods (20, Pl. XXXVII, fig. 11) than that of *C. britannicus*, from which, also, diagonal striae are apparently absent.

The Molecap specimens obtained *in situ* are from the lower half of the *Marsupites* subzone; the McIntyre Gully specimens are from the upper half of the same subzone. A fairly well preserved left valve from One Tree Hill is in the Western Australian Museum collection. In colour the shells are pale cream, very pale pink, or pale grey.

Chlamys clarkei sp. nov.

Pl. II, figs. 7, 8.

The available material consisted of a single fairly well preserved right valve and a specimen showing the interior of a much smaller right valve partly superimposed on the interior of the apparently corresponding left valve. Both specimens are from the lower portion of the *Marsupites* subzone at Molecap.

Dimensions :—

		Holotype. Right Valve.	Small. Right Valve.	Small. Left Valve.
		mm.	mm.	mm.
Height	....	16.6	9.6	9.8 ?
Length	....	15.2	9.2 ?	9.3 ?

Diagnosis :—Shell small, thin, somewhat obliquely ovate with the anterior portion produced, height rather greater than length, inequivalve, inequilateral; antero-dorsal margin concave and longer than postero-dorsal, which is slightly convex and passes insensibly into the ventral margin; submargins narrow. Ears unequal and rather large; byssal sinus well-marked but rather narrow. Hinge-line straight, longer than half the height of the shell. Umbones fairly sharp, apical angle of holotype about 90°, those of smaller valves rather greater. Ventral margin entire. Ventral arc includes an angle of about 220°. Pallial line obscure.

Right valve flat; the disk smooth for a short distance below the umbo, thence the radial ornament consists of exceedingly fine threads arranged in groups of two or three, the threads of each group uniting at a distance from the umbo equal to about two-fifths of the height of the valve, to form low rounded ribs. The main ribs, from 20 to 22 in number, are separated by shallow rounded furrows only slightly wider than half the width of the ribs; rarely a pair of narrower ribs takes the place of a normal rib. The last two ribs on each side are slightly obsolete. Single secondary riblets, usually threadlike, but varying in width and length, are present in some of the furrows, being more common on the anterior half of the holotype. One growth-ring, about half-way between the umbo and the ventral margin, is present on the holotype; though well-marked, it is not raised abruptly above the next lamina as in larger specimens of *Chlamys ginginensis*. Concentric ornament consists of very faint, low, rather widely spaced threading, perceptible only on the median ribs. Diagonal striae similar to those of *C. subtilis* and *C. ginginensis* are noticeable in the

radial furrows, the change of direction of these occurring some distance anteriorly of the median line in the holotype. Anterior ear large, deep, produced, distal margin convex and curving downward and inwards to a well-marked, but shallow, byssal sinus; ear decorated with about six narrow radial riblets, on which there is a trace of concentric threading. Fasciole broad and well-marked and ornamented with about 16 closely-set strong concentric ridges inclined towards the umbo. Ctenolium with about seven minute spines. Posterior ear small, triangular, oblique, decorated with two more prominent beaded riblets as well as a pair of narrower riblets near the junction with the disk. Dorsal portion of interior of disk smooth, ventral half faintly corrugated in harmony with the exterior ribbing. Colour of valve very pale pink.

Left valve moderately convex; exterior not seen, but the main radial ornament appears to be similar to that of the right valve; traces of fine diagonal striae in the furrows are visible through the shell. Anterior ear not seen. Posterior ear small, triangular, oblique. Interior of valve more strongly corrugated than that of the corresponding small right valve, the corrugation extending much nearer to the umbo, suggesting a corresponding extension of the main exterior ribbing. Lirae absent.

Remarks:—This species resembles *Chlamys ginginensis* fairly closely in its proportions and ornament, but differs from it in the shape and larger size of the anterior ear of the right valve, the greater obliquity of the disk, and the number and smaller size of the spines of the ctenolium. The number of ribs is slightly greater and the ribs do not appear to bifurcate as in some specimens of *C. ginginensis*. Moreover, the hinge-line is straight, whereas that of *C. ginginensis* usually descends slightly from the umbo. The fine radial threading which represents the ribs near the umbo in both these species suggests their descent from a finely ribbed species such as *C. subtilis*, a close relationship to which is also indicated by the similarity of the concentric ornament and diagonal striation of the three species. *Camptonectes* ? *ellipticus* may possibly also be a member of the same group.

Although covered by Meek's definition (12, p. 39), the diagonal striation of the three species of *Chlamys* just described differs from the true *Camptonectes* striation, as found in the species of that subgenus and in some species of *Chlamys* and *Aequipecten*, in the direction of the striae on the median portion of the shell and in the lesser degree of curvature of the striae. In the *Camptonectes* striation, the striae on the median portion are more nearly radial and, in species of *Chlamys* and *Aequipecten*, approach parallelism to the median ribs, whereas in the three Gingin species the striae in the median portion of the shell are directed downwards and outwards at an angle usually of about 45° , but occasionally as much as 50° , from the median line or, more correctly, from the radial line of origin, as the change of direction does not always occur at the median rib, but may occur at some distance from it; the striae on the opposite sides of the line of change, therefore, diverge from each other at an angle of 90° or more. As the direction of the striae close to the junction of the ventral and dorsal margins is approximately normal to the median line, the curvature of the striae is much less than in the *Camptonectes* striation. The change of direction is not always constant; in the holotype of *Chlamys clarkei* a change of direction occurs at a radial thread in a furrow situated anteriorly of the median line, but the striae in the next anterior furrow revert to the posterior direction, finally returning to the anterior direction in the third anterior furrow, thus producing a local herring-bone pattern. In a specimen of *Chlamys ginginensis* a partial change occurs

in the furrow immediately anterior to the median rib, the striae below the main growth-ring being directed anteriorly, whereas those above the growth-ring are directed posteriorly, the change being completed in the next anterior furrow.

Among the European Cretaceous species, *Pecten dutemplei* D'Orb. (11 p. 59, fig. 27) appears to be striated similarly to the Gingin shells.

***Chlamys curvicosta* sp. nov.**

Pl. II, figs. 9, 10.

A very imperfect specimen (U.W.A. 17199), showing the mould and portions of the interior of a right valve represents a species of *Chlamys* which differs from those already described in the curvature of its ribs, though broadly resembling them in type of sculpture. A postero-ventral fragment, showing the exterior, of another right valve appears also to belong to this species. The more complete specimen consists only of the exterior mould and part of the ventral portion and the postero-dorsal portion of the valve, but the mould is so clearly marked that details of the external sculpture and the shape of the anterior ear can be readily determined. Height of shell 17.4 mm.; length 16.2 mm.; length of hinge 8.8 mm. Locality of specimen not stated, but probably Molecap; the smaller fragment is from Molecap.

Diagnosis:—Shell small, thin, suborbicular, height rather greater than length, inequilateral; antero-dorsal margin concave and longer than postero-dorsal which is short and passes imperceptibly into the ventral margin; submargins narrow. Hinge-line straight, hinge consisting of two pairs of narrow crura separated by very narrow furrows; ears small and unequal, byssal sinus well-marked; umbo sharp, apical angle about 86° . Ventral margin delicately scalloped; ventral arc includes an angle of about 230° . Interior of shell nearly smooth, ventral half faintly fluted in harmony with major exterior ribbing.

Right valve very slightly convex, the more complete specimen ornamented with about 34 narrow riblets, beginning almost at the tip of the umbo; the riblets may have been rather fewer in number on the shell represented by the postero-ventral fragment; the riblets near the lateral margins are simple, those near the posterior margin being apparently wider than those near the anterior, but the median riblets are composed of groups of, usually, three fine threads; one or two threads are interpolated in some of the interspaces which are shallow and rounded and about equal in width to the riblets. The riblets on the anterior third of the disk are fairly strongly curved in harmony with the antero-dorsal margin, with the concave sides facing anteriorly, the curvature increasing towards the margin; the curvature of the median and posterior riblets is relatively slight. On the small postero-ventral fragment the seven posterior riblets are simple; of these the remnants of the two nearest the dorsal margin are flat and obsolete, the next two low and rounded and about equal in width to the interspaces, becoming wider, flatter, and obsolete near the ventral margin; the remaining three are narrow above, but widen rapidly ventrally, the interspaces remaining constant in width; single radial threads are present in the interspaces between these last three riblets; the eighth riblet consists of two threads, but the ninth, though consisting of two threads above, becomes simple towards the ventral margin; the remaining three riblets visible are each composed of three low threads. The concentric ornament consists of exceedingly numerous and

fine threads best seen where they cross the radial threads. Diagonal striae similar to those already described are clearly defined in the radial furrows, the change of direction of the striae occurring, in the more complete specimen, posteriorly of the median line. Anterior ear produced, distal margin convex, byssal margin straight; the impression shows traces of at least three radial threads. Posterior ear small, triangular, oblique, ornament not seen.

Left valve not seen.

Remarks.—This species differs from those of the *Chlamys subtilis* - *C. ginginensis* group in the curvature of its ribs and the scalloping of its ventral margin, but a relationship to that group is suggested by the similarity in type of sculpture, the radial ornament being about midway between that of *C. subtilis* on the one hand and *C. ginginensis* and *C. clarkei* on the other; the concentric threading is very similar to that of *C. subtilis* and the diagonal striation is similar to that of all three species of the group; the shape of the anterior ear is something between that of *C. subtilis* and that of *C. clarkei*.

Chlamys teichertii sp. nov.

Pl. II, fig. 11.

A single imperfect specimen from Molecap differs markedly from the species of *Chlamys* already described. It consists of the internal cast, the posterior half of the disk, and both ears of a left valve. Height 9.5 mm; length 9.3 mm; length of hinge 3.8 mm.

Diagnosis.—Shell small, thin, suborbicular, length almost equal to height, nearly equilateral; dorsal margins about equal in length, the postero-dorsal straight, antero-dorsal slightly concave. Hinge-line straight, ears of moderate size, unequal. Umbo not very sharp, apical angle obtuse, about 96°. Ventral margin apparently scalloped. Ventral arc includes an angle of more than 200°. Interior of shell smooth.

Left valve moderately convex, the dorsal third of the disk smooth, the remaining two-thirds ornamented with, probably, 21 narrow ribs, high, angular, simple and well defined on the middle of the valve, but becoming obsolete towards the lateral margins; the four lateral ribs are adorned with, usually, three short, closely-set, relatively large spines. Interspaces about twice as wide as the ribs and smooth. No other ornament visible on the disk except a very faint, fine, concentric striation. Anterior ear triangular, with oblique, very slightly convex, distal margin. Posterior ear rather smaller, triangular, oblique, marked off from the disk rather more sharply than the anterior ear. Both ears ornamented with two rather faint growth lines and exceedingly faint concentric striae. Exterior surface of valve has a waxy lustre and a pale creamy brown colour. Interior surface smooth, except for a curious narrow, wire-like concentric flange which starts at the junction of the dorsal and ventral margins and continues downwards just within the ventral margin. Two pairs of cardinal crura appear to be present, the lower pair being short, but the hinge structure could not be determined with certainty.

Remarks.—I have placed this species under *Chlamys*, but the nearly circular outline, wide apical angle, fine concentric striation, and waxy lustre suggest a relationship to *Syncyclonema*. Discovery of the right valve might throw further light on the affinities of the species.

Subgenus **PSEUDAMUSSIUM** H. and A. Adams. 1858.

Pseudamussium candidus sp. nov.

Pl. I., fig. 9 ; Pl. II., figs. 13, 14.

The material examined consisted of ten specimens in varying states of preservation, including one of both valves, from Molecap ; one nearly complete left valve from " the North Chalk " ; and portions of the disks of four valves from McIntyre Gully.

Dimensions :—

	Syntype. Left Valve. Molecap. mm.	Right Valve. Molecap. mm.	Left Valve. Nth. Chalk. mm.	Both valves. Molecap. mm.	UWA17202 Left valve. Molecap. mm.	Syntype. Right valve. Molecap. mm.
Height...	8.3	7.4	5.8	5.6	5.15	4.8
Length	9.3	8.4	6.7	6.3	5.5	6.0

The average proportion of height to length of eight specimens is 100 to 114.5. The thickness of the specimen of united valves is 2.0 mm.

Diagnosis.—Shell small, thin, smooth, hyaline to porcellanous, length greater than height, a little inequivalve, both valves slightly to moderately convex, the left valve on the average a trifle more so than the right ; inequilateral, produced anteriorly. Antero-dorsal margin a little longer than postero-dorsal and slightly concave towards the umbo, postero-dorsal slightly convex, both merging imperceptibly into the ventral margin. Hinge-line straight or slightly concave ; ears small, the anterior a little larger than the posterior and more sharply marked off from the disk, the posterior ear being obsolete ; byssal sinus small. Umbones not very sharp and rarely rising above the hinge-line ; apical angle variable, ranging from about 95° to 120° but usually about 109°. Ventral margin entire. Valves closed ; lateral portions of commissure slightly curved, convexly on the right valve, concavely on the left. Interior of shell smooth ; pallial line obscure ; details of hinge not seen.

Right valve nearly flat to moderately convex ; ornament, barely discernible even with a lens, consists of very fine concentric striae and a few slightly more noticeable evenly-spaced growth-lines. Anterior ear rather larger than posterior, produced, distal margin convex, ventral margin descending obliquely to a well-defined but small byssal notch ; ear depressed at the junction with the disk to form a narrow, radially triangular groove, the margin of the disk bending abruptly to meet the ear at approximately a right angle ; at the junction, the concentric ornament becomes much more pronounced to form a narrow band of cross ridges and furrows which extend for a short distance on the ear itself, the termination of the cross ridges on the ear and the disk being less abrupt than on the fasciole of *Chlamys*. Posterior ear small, triangular, oblique, not sharply differentiated from the disk.

Left valve slightly more convex than the right, with similar concentric ornament. Anterior ear slightly larger than posterior, triangular, distal margin straight and very slightly oblique ; junction of ear and disk sharply defined as on the right valve and similarly marked by abrupt accentuation of the concentric ornament, but without a defined groove. Posterior ear oblique ; its junction with the disk rather better defined than that of the right valve.

ribs higher and much narrower on the median half of the disk, but becoming lower, wider and obsolete as they approach the submargins, the difference between the median and outer ribs being very marked. Closely spaced incremental lines pass over the ribs as very low threads, those near the ventral margin imbricating slightly. Anterior ear of moderate size, distal margin slightly convex; it appears smooth except for very fine incremental lines. Posterior ear not seen.

BIBLIOGRAPHY.

1. Adams, H. and A. Genera of Recent Mollusca, Vol. 2, London, 1858.
2. Arkell, W. J. British Corallian Lamellibranchia: *Palaeont. Soc.*, Vol. LXXXII., pp. 73-104, 1928; Vol. LXXXIII., pp. 105-128, 1929.
3. Dall, W. H. Contributions to the Tertiary Fauna of Florida: *Trans. Wagner Free Inst. Sci.*, Vol. III., pt. IV., pp. 689-758, 1898.
4. Davies, A. Morley. Tertiary Faunas, Vol. I., London, 1935.
5. Dechaseaux, Colette. Pectinidés jurassiques de l'Est du Bassin de Paris: *Theses presentees a la faculte des Sciences de l'Universite de Paris*, Serie A, No. 1619, 1936.
6. Etheridge, Robert, junior. The Cretaceous Fossils of the Gingin Chalk: *W.A. Geol. Survey Bull.* 55, 1913.
7. Gardner, Julia. The Molluscan Fauna of the Alum Bluff Group of Florida: *U.S. Geol. Survey Prof. Paper* 142-A, 1926.
8. Glauert, L. Further Notes on the Gingin Chalk: *Journ. Roy. Soc. W.A.*, Vol. XII., pp. 5-12, 1925.
9. Glauert, L. A List of Western Australian Fossils: *W.A. Geol. Survey Bull.* 88, pp. 36-72, 1926.
10. Jack, R. L. and Etheridge, Robert, junior. The Geology and Palaeontology of Queensland and New Guinea, Brisbane, 1892.
11. Jukes-Brown, A. J. The Cretaceous Rocks of Britain: *U.K. Geol. Survey Mem.*, Vol. I., 1900.
12. Meek, F. B. Check List of the Invertebrate Fossils of North America, Cretaceous and Jurassic: *Smithsonian Misc. Coll.* 177, 1864.
13. Moore, Charles. Australian Mesozoic Geology and Palaeontology: *Quart. Journ. Geol. Soc.*, Vol. XXVI., pp. 226-261, 1870.
14. Stoliczka, Ferdinand. Cretaceous Fauna of Southern India: *Palaeont. Indica* ser. VI., Vol. III., 1871.
15. Tenison-Wood, J. E. On Some Mesozoic Fossils from Central Australia: *Proc. Linn. Soc., N.S.W.* for 1883, Vol. VIII., pp. 239, 240.
16. Wade, Bruce. The Fauna of the Ripley Formation on Coon Creek, Tennessee: *U.S. Geol. Survey Prof. Paper* 137, 1926.
17. Withers, T. H. The Occurrence of the Crinoid *Uintacrinus* in Australia: *Journ. Roy. Soc. W.A.*, Vol. XI., pt. 2, pp. 15-18, 1924.
18. Withers, T. H. The Crinoid *Marsupites* and a New Cirripede from the Upper Cretaceous of Western Australia: *Journ. Roy. Soc. W.A.*, Vol. XII., pp. 97-104, 1926.
19. Woodring, W. P. Miocene Mollusks from Bowden, Jamaica: *Carnegie Inst. Washington Pub.* No. 366, 1925.
20. Woods, Henry. The Cretaceous Lamellibranchia of England, Part IV.: *Palaeont. Soc.*, Vol. LVI., pp. 145-196, 1902.
21. Woods, Henry. The Cretaceous Faunas of the North-eastern Part of the South Island of New Zealand: *N.Z. Geol. Survey Palaeont. Bull.* No. 4, 1917.

Remarks.—This species shows a fairly close resemblance to the North American Tertiary species *P. defuniak* Gardner (7, p. 49, Pl. XII., figs. 10–12), but its ears are relatively smaller and the two species differ in their proportions, the Gingin shell being longer than high and more markedly inequilateral. The only Australian Cretaceous species which would appear from the descriptions to resemble the Gingin species in any way is *Pecten psila* Tenison-Wood (15, pp. 239, 240), which, judging by the description and Etheridge's figure (10, p. 446, Pl. 21, fig. 5), may be referable to *Pseudamussium*; *Pecten psila* is, however, higher than long, its byssal notch is apparently very shallow and its ears are described as radially ribbed.

Pseudamussium candidus is the least rare of the Gingin pectens. The Molecap specimens are from the lower half of the *Marsupites* subzone, between 3 and 5 feet above the base of the chalk in that locality. The North Chalk specimen is from the corresponding horizon. So far as I am aware, no specimens have been found in the *Marsupites* subzone at McIntyre Gully, the four imperfect specimens from that locality having been obtained from about 15 feet above the top of the *Marsupites* subzone. A specimen (11363F) from One Tree Hill is in the Geological Survey collection.

Although small and usually milk-white and translucent, the glossy surface of this shell serves to distinguish it from the surrounding chalk.

PECTENS FROM THE LOWER GREENSAND.

Two very imperfect specimens were recently found by Dr. R. W. Fairbridge in the Lower Greensand of McIntyre Gully, at about 10 feet below the base of the Chalk. They consist of a small shell recognisable as the left valve of a *Chlamys* and the cast, with traces of ironstained test, of a somewhat larger shell which may also represent a *Chlamys*, but which is insufficiently preserved for determination. Its description is as follows:—Height 23.5 mm.; length about 21 mm. Shell of moderate size, thin, ovate, height greater than length. Dorsal margins long, about 15 mm.; apical angle less than 90°. Ventral margin probably slightly scalloped. Ventral arc includes a relatively small angle. Valve decorated with about 30 rounded ribs and occasional secondary ribs in the furrows, which are about equal in width to the ribs. Traces of concentric threading present. No marked difference between the median and lateral ribs.

The smaller shell, which has portion of the anterior ear remaining, is sufficiently well-preserved for specific diagnosis.

Chlamys fairbridgei sp. nov.

Pl. II., fig. 12.

Height of specimen approximately 15.8 mm.; length 13.9 mm.

Diagnosis.—Shell small, thin, ovate, height greater than length, inequilateral. Dorsal margins long, antero-dorsal straight, with pronounced shoulder at its junction with the ventral margin; apical angle probably greater than 90°. Ventral margin slightly scalloped.

Left valve moderately convex, depressed near ventral margin, compressed at anterior submargin. Disk ornamented with 23 or 24 low, narrow rounded ribs separated by interspaces usually nearly twice as wide as the ribs; occasional secondary riblets interpolated in the interspaces. The main

PLATE I.

Figs. 1-3: *Syncyclonema (Cteniopleurium) subserratus*.

1. Syntype; a slightly weathered right valve.
2. Syntype; a left valve, somewhat crushed near the umbo but with well preserved glossy surface.
3. Another left valve.
All from Molecap.

Figs. 4, 5: *Syncyclonema (Cteniopleurium) subreticulatus*.

4. Holotype; a partly decorticated right valve, McIntyre Gully.
5. Assembled fragments of a smaller right valve, Molecap.

Figs. 6-8: *Syncyclonema (Cteniopleurium) perspinosus*.

6. Holotype; a large left valve.
7. A smaller left valve.
8. Interior of another large left valve.
All from Molecap.

Fig. 9: *Pseudamussium candidus*.

9. Syntype; a small right valve, Molecap.

Figs. 1-8 x 1½; fig. 9 x 3.

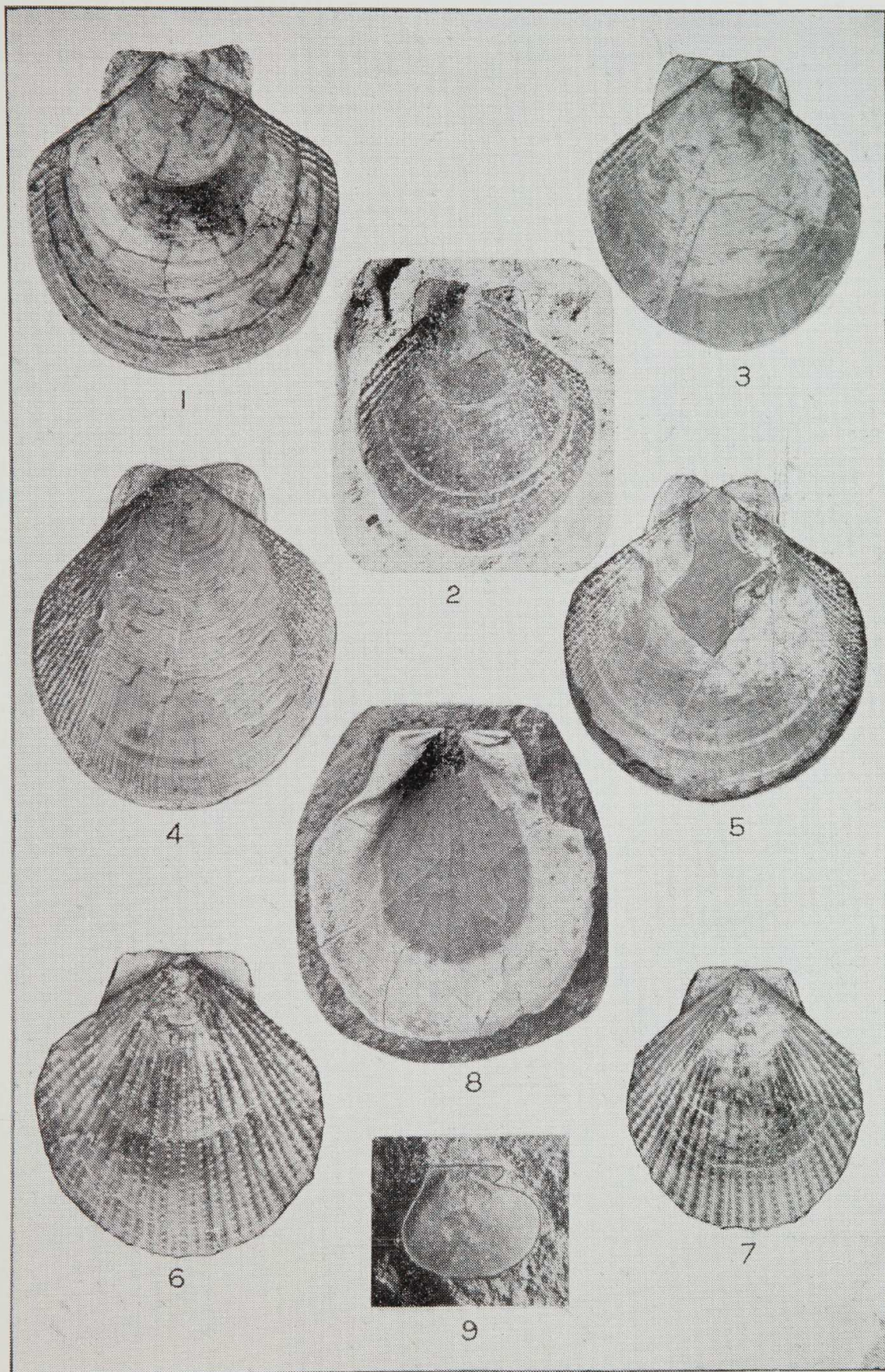


PLATE I.

PLATE II.

Figs. 1-3: *Chlamys subtilis*.

1. Holotype; a slightly damaged right valve.
 2. A large left valve.
 3. A small right valve.
- All from Molecap.

Figs. 4-6: *Chlamys ginginensis*.

4. Cotype; an imperfect right valve, outlines of ears restored.
 5. Cotype; portion of another right valve; 5a. Interior and mould of same shell.
 6. Portion of a large left valve; 6a. Interior of same shell.
- All from Molecap.

Figs. 7, 8: *Chlamys clarkei*.

7. Holotype; a right valve with well preserved ears.
8. Interiors of two small valves, the right valve superimposed upon the left. Both specimens from Molecap.

Figs. 9, 10: *Chlamys curvicosta*.

9. A well preserved mould with portions of the interior of a right valve, outline of anterior ear emphasised; probably from Molecap.
10. Postero-ventral portion of a right valve, apparently of the same species, from Molecap.

Fig. 11: *Chlamys (?) teichertii*.

Cast and portion of shell of a left valve, from Molecap.

Fig. 12: *Chlamys fairbridgei*.

A very imperfect left valve from the Lower Greensand, McIntyre Gully; outline partly restored.

Figs. 13, 14: *Pseudamussium candidus*.

13. Syntype; a left valve, the largest specimen found.
 14. A well preserved small left valve.
- Both from Molecap.

Figs. 1, 2, 4-9 and 12 x 1½; fig. 3 x 2; figs. 10, 11, 13 and 14 x 3.

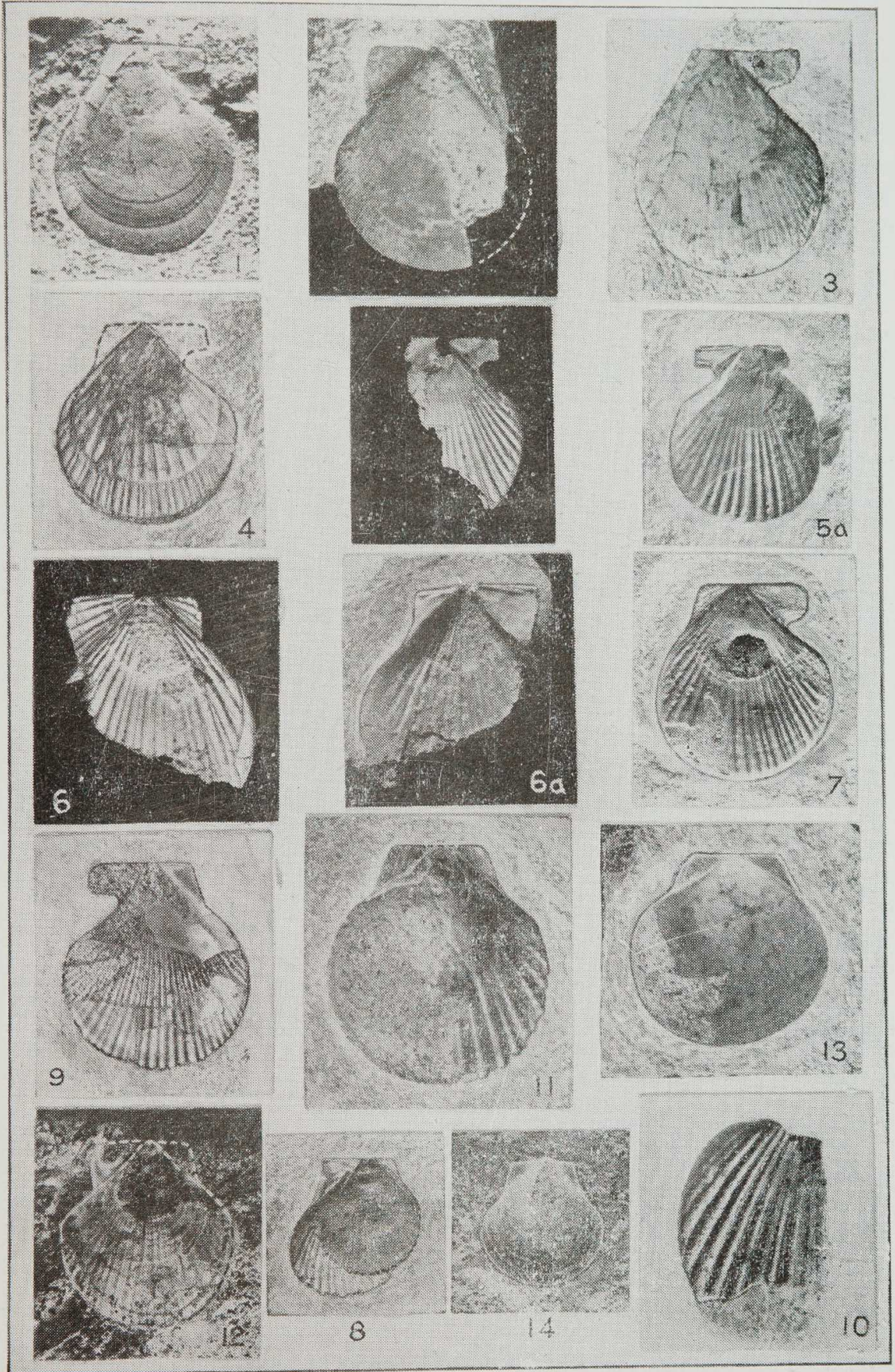


PLATE II.